

Purpose:

To develop a software program that accurately calculates the composite planned dose when combination of different modalities and/or radiation treatment plans, produced by the same or different treatment planning systems (TPS), is used for the patient's treatment.

Methods:

MATLAB programming environment was used to develop an in-house software that calculates the total dose from a combination of CT-based treatment plans from the same or different TPS. Through a graphical interface, the software imports up to five DICOM-RT dose files, as exported by commercially available software such as Pinnacle or TomoTherapy TPS. Selecting the coordinate system of an input 3D-dose file as reference, solid body transformations are applied to the rest and necessary dose normalizations are performed for partially treated plans before the full dose is calculated. The produced 3D-dose is re-sampled according to user-defined resolution parameters and exported in binary format, along with a script file containing necessary resolution and positioning information with reference to the patient's CT image set. It is then imported into Pinnacle TPS, as a new trial in a previously existing patient's plan, for clinical evaluation.

Results:

For demonstration purposes, two TomoTherapy treatment plans developed for a prostate case to treat the lymphatics and prostate to 54Gy, followed by a field reduction to the prostate alone for an additional dose of 24Gy, were exported and the composite dose was calculated using our software. Isodose evaluation of the total calculated dose, as displayed in Pinnacle TPS, showed the expected distribution, in very good agreement with the individual plans.

Conclusions:

An in-house software was developed for quick and easy calculation and evaluation of composite 3D-dose for patients previously treated with radiation or undergoing treatment through a combination of different treatment plans. It has been successfully used clinically in our institution for the past six months.